

**P. A. Harper Associates.**

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SHEET No

L01

REV

PROJECT No

26/092

DATE

MAY '26

PROJECT

PRIME OAK BUILDINGS LTD.  
FENLAYSON - 97267

PREPARED BY

*[Signature]*

## PRELIMINARY CALCULATIONS FOR LIFTING FRAME

### DEAD WEIGHT FOR LIFTING

TYPICAL OAK FRAME - 40 kg/m<sup>2</sup>

TYPICAL DASTERS - 12 kg/m<sup>2</sup>

|        |            |                                          |   |                       |
|--------|------------|------------------------------------------|---|-----------------------|
| ROOF - | TILES.     | $60 \div 60 \div 35$                     | = | 72                    |
|        | BATTERS.   | $500 \times 0.038 \times 0.025 \div 0.1$ | = | 5                     |
|        | FELT.      | $1.5 \div 60 \div 35 \times 1.1$         | = | 2                     |
|        | PAPERS.    |                                          | = | 12                    |
|        | INSULATION | $40 \div 60 \div 35$                     | = | 5                     |
|        | CEILING    | $15 \div 60 \div 35$                     | = | 18                    |
|        |            |                                          |   | <hr/>                 |
|        |            |                                          |   | 115 kg/m <sup>2</sup> |

|       |            |                                                   |   |                      |
|-------|------------|---------------------------------------------------|---|----------------------|
| WALLS | BOARDS     | $700 \times 0.025 \times 1.2$                     | = | 21                   |
|       | PLY        |                                                   | = | 10                   |
|       | STUDS      | $500 \times 0.1 \times 0.05 \times 1.1 \div 0.45$ | = | 7                    |
|       | INSULATION |                                                   | = | 4                    |
|       | PLASTER    |                                                   | = | 15                   |
|       | OAK FRAME. |                                                   | = | 40                   |
|       |            |                                                   |   | <hr/>                |
|       |            |                                                   |   | 97 kg/m <sup>2</sup> |

|       |                          |                                                 |   |                       |
|-------|--------------------------|-------------------------------------------------|---|-----------------------|
| FLOOR | PARTITIONS/FITTINGS ETC. |                                                 | = | 30                    |
|       | BOARDS                   |                                                 | = | 10                    |
|       | TOLSTS.                  | $500 \times 0.2 \times 0.05 \div 0.45 \times 1$ | = | 15                    |
|       | UNDER LINING             |                                                 | = | 10                    |
|       | STEEL FRAME.             |                                                 | = | 60                    |
|       |                          |                                                 |   | <hr/>                 |
|       |                          |                                                 |   | 137 kg/m <sup>2</sup> |

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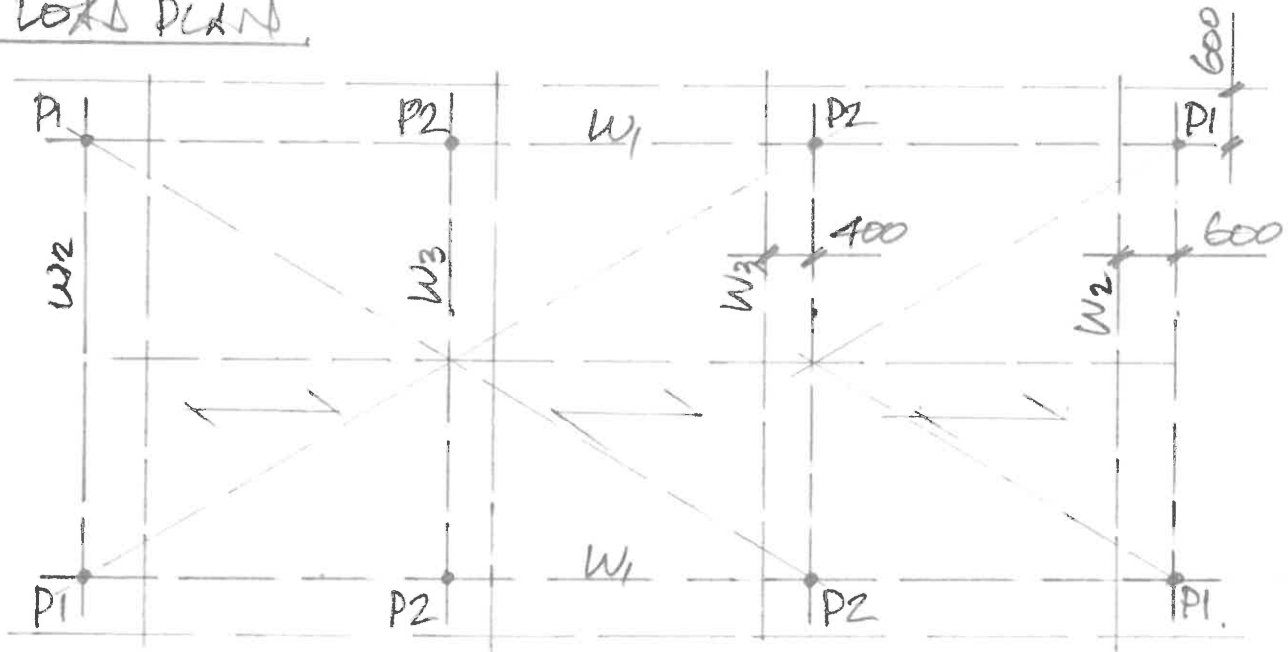
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LOAD PLAN



$$W_1 = 97 \times 2.2 = 213 \text{ kg/m} \times 10.5 \times 2 = 4473$$

$$W_2 = 97 \times 2.2 + 137 \times 3.5/2 = 453 \text{ " } \times 4.0 \times 2 = 3624$$

$$W_3 = 137 \times 3.5 = 480 \text{ " } \times 4.0 \times 2 = 3840$$

$$P_1 = 115 \times 40/2 \times 3.5/2 = 403 \text{ kg } \times 4 = 1612$$

$$P_2 = 115 \times 40/2 \times 3.5 = 805 \text{ " } \times 4 = 3220$$

16.8T

LOADS FOR LIFTING FRAME

$$W_1 = 213 \times 10/1000 = 2.13 \text{ kN/m}$$

$$W_2 = 453 \times \text{ " } = 4.53 \text{ "}$$

$$W_3 = 480 \times \text{ " } = 4.80 \text{ "}$$

$$P_1 = 403 \times \text{ " } = 4.03 \text{ kN}$$

$$P_2 = 805 \times \text{ " } = 8.05 \text{ "}$$

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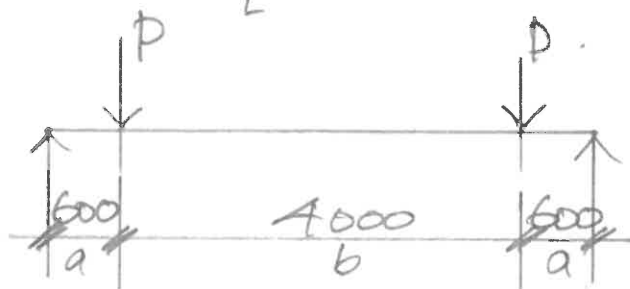
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## LIFTING FRAME BEAMS.

### CROSS BEAMS.

SPAN. 5200



### END BEAMS.

$$P = 4.03 + 2.13 \times 3.5/2 + 4.59 \times 4.0/2 = 16.8 \text{ kN}$$

### INTERNAL BEAMS.

$$P = 8.05 + 2.13 \times 3.5 + 4.80 \times 4.0/2 = 25.1 \text{ kN}$$

$$M = 25.1 \times 0.6 = 15.1 \text{ kNm}$$

$$I_{req} = \frac{25100 \times 600 (3 \times 5200^2 - 4 \times 600^2)}{24 \times 2.1 \times 10^5 \times 5200/360} = 16.5 \times 10^6 \text{ mm}^4$$
$$= 1650 \text{ cm}^4$$

Try 152 x 152 UC 37.

$$f_{bc} = 15.1 / 0.273 = 55.$$

$$e/m = 4000 / 38.7 = 103.$$

$$A_{27} = 152 / 11.5 = 13.$$

$$\left. \begin{array}{l} f_{bc} = 55 \\ A_{27} = 13 \end{array} \right\} p_{bc} = 148 \text{ N/mm}^2$$

PROVISE 152 x 152 UC 37

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MAIN LIFTING BEAMS.



$$P_1 = 16.8 \text{ kN}$$

$$P_2 = 25.1 \text{ kN}$$

SEE PRINTOUT FOR ANALYSIS. - TRY 305x165 UB40.

$$M = 33.6 \text{ kNm}$$

$$f_{bc} = 33.6 / 0.563 = 60$$

$$l_{fu} = 6500 \times 0.85 / 38.5 = 144$$

$$d/t = 305 / 10.2 = 30$$

$$\left. \begin{array}{l} f_{bc} = 60 \\ f_{tu} = 90 \end{array} \right\} f_{bc} = 90 \text{ kN}$$

PROVISE 305x165 UB40.



Joint numbers

|                                              |                                  |  |                          |           |
|----------------------------------------------|----------------------------------|--|--------------------------|-----------|
| <i>Quikframe - Plane Frame Analysis 8.60</i> | <b>P A HARPER ASSOCIATES LTD</b> |  | Printed : 16/05/2026     | Sheet : 1 |
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|                                              |                                  |  | Designed : PAH           | Checked : |



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Sections diagram

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**Section groups**

BEAM - Steel - 305x165x40UB S275



|       |   |       |        |
|-------|---|-------|--------|
| Depth | = | 303.4 | mm     |
| E     | = | 205.0 | kN/mm2 |
| I     | = | 8503  | cm4    |
| A     | = | 51.32 | cm2    |

**Joints**

| Name | X<br>m | Y<br>m |
|------|--------|--------|
| J1   | -0.000 | 0.000  |
| J2   | 2.000  | 0.000  |
| J3   | 8.500  | 0.000  |
| J4   | 10.500 | 0.000  |

**Members**

| Name | Length<br>m | Section group | Ends<br>Left/low' | Other | Joints  |
|------|-------------|---------------|-------------------|-------|---------|
| M1   | 2.000       | BEAM          | Fix               | Fix   | J1 to 2 |
| M2   | 6.500       | BEAM          | Fix               | Fix   | J2 to 3 |
| M3   | 2.000       | BEAM          | Fix               | Fix   | J3 to 4 |

**Bases**

| Name | Joint | Horizontal<br>kN/m | Vertical<br>kN/m | Rotational<br>kN.m/Rad |
|------|-------|--------------------|------------------|------------------------|
| B1   | J2    | Fixed              | Fixed            | Pinned                 |
| B2   | J3    | Free               | Fixed            | Pinned                 |

**Load cases**

| Name | Type           |
|------|----------------|
| DEAD | Permanent dead |

**Load combinations**

| Name | Limit | Factor | Load case |
|------|-------|--------|-----------|
| DEAD | SLS   | 1.00   | DEAD      |

**Point loads****Load case : DEAD**

| Name | Member | Value<br>kN | Distance<br>m | Measured<br>from | Direction |
|------|--------|-------------|---------------|------------------|-----------|
| L1   | M1     | 16.80       | 0.000         | Left end         | Vertical  |
| L2   | M3     | 16.80       | 2.000         | Left end         | Vertical  |
| L3   | M2     | 25.10       | 1.500         | Left end         | Vertical  |
| L4   | M2     | 25.10       | 5.000         | Left end         | Vertical  |

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**Forces - Linear elastic analysis****Loading combination: DEAD**

| Member | Distance<br>m | Measured<br>from | Axial<br>kN | Sense | Shear<br>kN | Moment<br>kN.m |
|--------|---------------|------------------|-------------|-------|-------------|----------------|
| M1     | 0.000         | Left end         | 0.00        |       | -16.80      | -0.00          |
|        | 2.000         | Left end         | 0.00        |       | -16.80      | -33.60         |
| M2     | 0.000         | Left end         | 0.00        |       | 25.10       | -33.60         |
|        | 1.339         | Left end         | 0.00        |       | 25.10       | 0.00           |
|        | 1.500         | Left end         | 0.00        |       | 25.10       | 4.05           |
|        | 1.500         | Left end         | 0.00        |       | -0.00       | 4.05           |
|        | 5.000         | Left end         | 0.00        |       | -0.00       | 4.05           |
|        | 5.000         | Left end         | 0.00        |       | -25.10      | 4.05           |
|        | 5.161         | Left end         | 0.00        |       | -25.10      | 0.00           |
|        | 6.500         | Left end         | 0.00        |       | -25.10      | -33.60         |
| M3     | 0.000         | Left end         | 0.00        |       | 16.80       | -33.60         |
|        | 2.000         | Left end         | 0.00        |       | 16.80       | -0.00          |

**Reactions - Linear elastic analysis****Loading combination: DEAD**

| Base | Joint | Horizontal<br>kN | Vertical<br>kN | Moment<br>kN.m |
|------|-------|------------------|----------------|----------------|
| B1   | J2    | 0.00             | 41.90          | 0.00           |
| B2   | J3    | 0.00             | 41.90          | -0.00          |

**Member deflections - Linear elastic analysis****Loading combination: DEAD**

| Member | Distance<br>m | Measured<br>from | Dx<br>mm | Dy<br>mm | Pz<br>Rad |
|--------|---------------|------------------|----------|----------|-----------|
| M1     | 0.000         | Left end         | 0.0      | -4.3     | 0.0028    |
|        | 0.333         | Left end         | -0.0     | -3.4     | 0.0027    |
|        | 0.667         | Left end         | -0.0     | -2.5     | 0.0026    |
|        | 1.000         | Left end         | -0.0     | -1.7     | 0.0023    |
|        | 1.333         | Left end         | -0.0     | -1.0     | 0.0019    |
|        | 1.667         | Left end         | -0.0     | -0.4     | 0.0015    |
|        | 2.000         | Left end         | 0.0      | 0.0      | 0.0009    |
| M2     | 0.000         | Left end         | 0.0      | 0.0      | 0.0009    |
|        | 1.083         | Left end         | 0.0      | 0.1      | -0.0004   |
|        | 2.167         | Left end         | 0.0      | -0.3     | -0.0003   |
|        | 3.250         | Left end         | 0.0      | -0.4     | 0.0000    |
|        | 4.333         | Left end         | 0.0      | -0.3     | 0.0003    |
|        | 5.417         | Left end         | 0.0      | 0.1      | 0.0004    |
| M3     | 6.500         | Left end         | 0.0      | 0.0      | -0.0009   |
|        | 0.000         | Left end         | 0.0      | 0.0      | -0.0009   |
|        | 0.333         | Left end         | 0.0      | -0.4     | -0.0015   |
|        | 0.667         | Left end         | 0.0      | -1.0     | -0.0019   |
|        | 1.000         | Left end         | 0.0      | -1.7     | -0.0023   |
|        | 1.333         | Left end         | 0.0      | -2.5     | -0.0026   |
|        | 1.667         | Left end         | 0.0      | -3.4     | -0.0027   |
|        | 2.000         | Left end         | 0.0      | -4.3     | -0.0028   |

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**Joint deflections - Linear elastic analysis****Loading combination: DEAD**

| Joint | Dx<br>mm | Dy<br>mm | Pz<br>Rad |
|-------|----------|----------|-----------|
| J1    | 0.0      | -4.3 ↓   | 0.0028 ↻  |
| J2    | 0.0      | 0.0      | 0.0009 ↻  |
| J3    | 0.0      | 0.0      | -0.0009 ↻ |
| J4    | 0.0      | -4.3 ↓   | -0.0028 ↻ |



Axial force diagram compression negative (kN.) - Linear elastic analysis  
Loading combination: DEAD

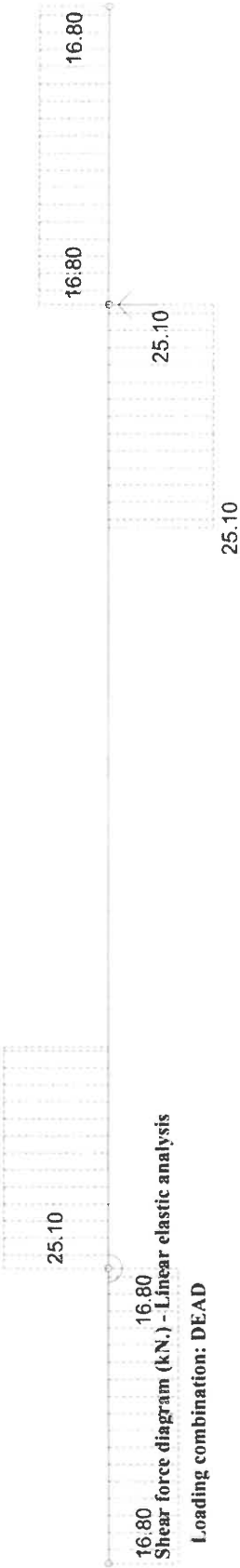
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Bending moment diagram (kN.m.) - Linear elastic analysis  
Loading combination: DEAD

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